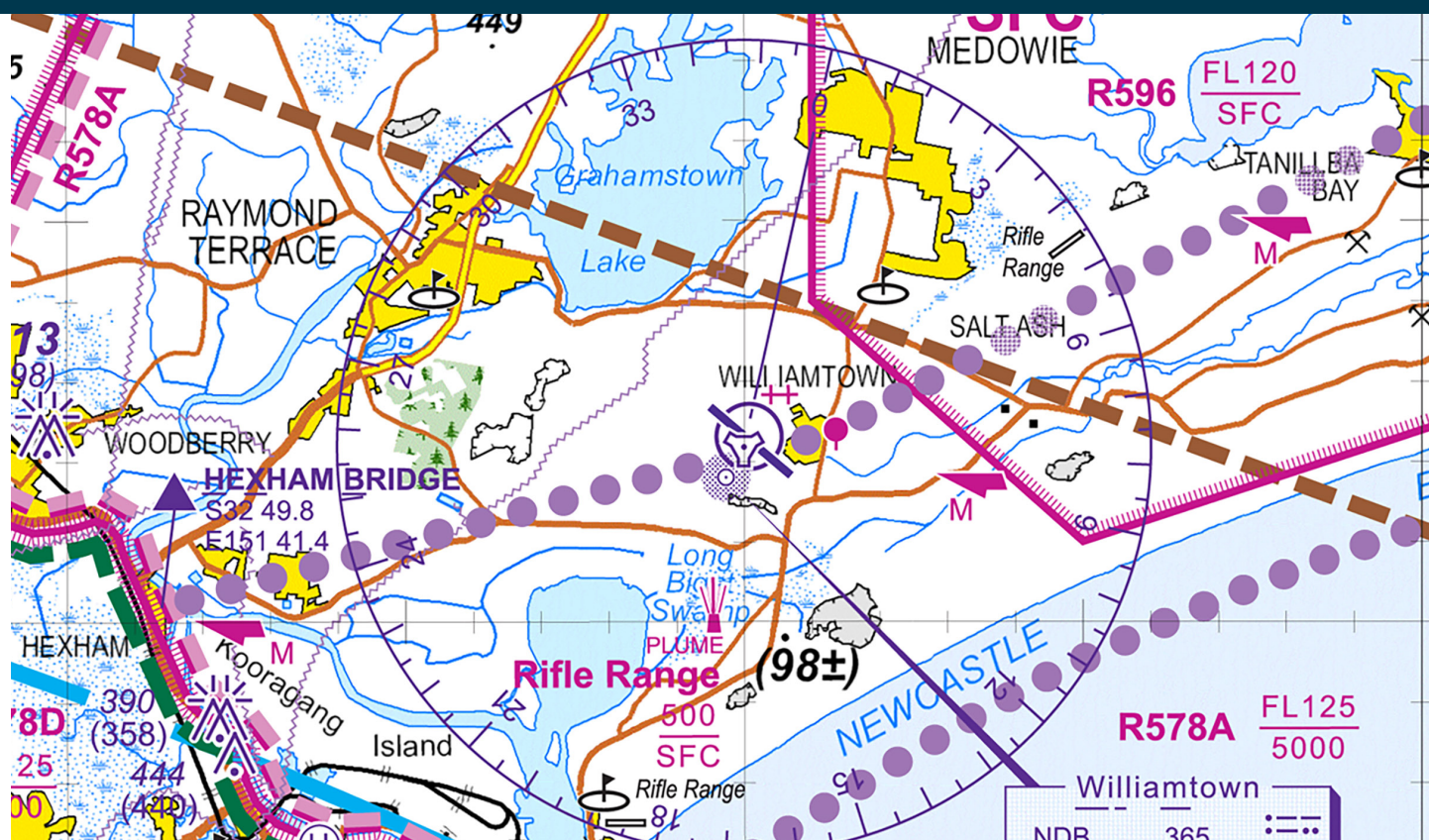




Australian Government
Australian Transport Safety Bureau

Loss of separation involving a Beechcraft B300, VH-FIZ and a formation of four Boeing F/A18 aircraft

near Williamtown, New South Wales | 19 September 2013



Investigation

ATSB Transport Safety Report

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Addendum

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Safety summary

What happened

On 19 September 2013, the pilot of a Beechcraft B300, registered VH-FIZ, was conducting calibration activities of ground-based navigation aids at Williamtown (Newcastle Airport), New South Wales.

During the calibration activities, the aircraft conducted a 7 NM (13.0 km) orbit around Williamtown. However, the Tower air traffic controller had intended the aircraft to hold south of Williamtown over land. At the same time, other aircraft were approaching Williamtown to land.

VH-FIZ tracked on the 7 NM arc towards, and then across the coast, on a converging path with a formation of four Boeing F/A18 aircraft that were on a visual approach to Williamtown. The formation flew directly below VH-FIZ with less than the required 1,000 ft separation.

What the ATSB found

The ATSB found that the applicability of a general requirement to conduct aviation risk assessments at Department of Defence aerodromes for complex, new, unusual or irregular activities was open to interpretation. This led to an absence of prior planning for the calibration activities, resulting in an air traffic control work-around on the day of the activities that did not address all related safety aspects. One work-around was that airspace over land usually controlled by Approach was transferred to the Tower. The resultant airspace controlled by the Tower was considerably larger than normal, resulting in the Tower controllers having difficulties visually monitoring the airspace and needing to rely on the surveillance display for situation awareness.

An instruction given to VH-FIZ to 'orbit' was insufficiently clear, resulting in the pilot misinterpreting it as permission to conduct a pre-planned 7 NM (13.0 km) orbit around Williamtown. As a result of the Tower controller's assumption that VH-FIZ would remain in the area they intended, the aircraft was not adequately visually monitored by the controllers in the Tower, or monitored on radar by the Approach controller. This removed any chance of early detection of the impending aircraft conflict. When the Tower controller did detect the conflict, clear control instructions were not immediately given to either VH-FIZ or the F/A18s, leading to a loss of separation.

What's been done as a result

The Department of Defence took proactive action to improve the implementation of aviation risk management (AVRM) to ensure that AVRM plans developed for unusual or irregular operations, such as calibration operations, addressed staffing and traffic levels, coordination and workload.

Safety message

Although not guaranteeing the absence of aircraft separation incidents, prior planning for unusual or irregular operations can permit the development of robust air traffic control defences that address the specific hazards of that operation. Aircraft separation safety also relies on controllers issuing specific control instructions to all pilots, along with the provision of timely and relevant traffic information to pilots of aircraft identified to be in conflict.

Williamtown Visual Terminal Chart



Source: Aairservices Australia

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The occurrence

At 1549 Eastern Standard Time¹ on 19 September 2013, a Hawker Beechcraft Corporation B300, registered VH-FIZ (FIZ), was conducting calibration operations at Williamtown (Newcastle Airport)² in NSW (Figure 1). While conducting a 7 NM (13.0 km) orbit around Williamtown at 3,100 ft (the broken blue line in Figure 1), a loss of separation (LOS) occurred between FIZ and a formation³ of four Boeing F/A18 aircraft (F18s). The formation of F18s flew directly below the B300 with less than the required 1,000 ft separation.

The calibration activity involved checking the equipment associated with the instrument landing system (ILS),⁴ which was aligned to runway 12,⁵ and the tactical air navigation system (TACAN).⁶ To complete the calibration, numerous approaches and manoeuvres were required to test the accuracy of the navigational equipment, each referred to as a run. The various planned runs each had a number on a run sheet held by both the pilot of FIZ and air traffic control (ATC).

The Williamtown ATC Tower controller normally had jurisdiction over the airspace within 5 NM (9.3 km) of Williamtown over land (dark green area in Figure 1), from the surface to 1,500 ft above mean sea level (AMSL),⁷ referred to as the aerodrome traffic zone (ATZ). Earlier in the day, additional airspace had been released by the Williamtown Approach controller to the Tower controller – over land within a 12 NM (22.2 km) radius of Williamtown, from the surface to 3,500 ft AMSL (light green area in Figure 1).

On the day of the occurrence, the wind at Williamtown favoured the use of runway 30 (marked in orange in Figure 1), so the majority of FIZ's approaches were to the opposite direction non-duty runway. To reduce traffic complexity, FIZ was permitted to conduct calibration runs while ATC held other aircraft on the ground or outside the airspace released to the Tower controller, while FIZ was held clear of traffic when a mix of military and civil aircraft were required to depart or arrive. The majority of military aircraft arrived via the *initial point*, marked by a pink cross in Figure 1 (see the section titled *Military operations*).

¹ Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

² Williamtown is known as Newcastle Airport for scheduled passenger flights.

³ A formation is two or more aircraft flown in close proximity to each other and operating as a single aircraft with regard to navigation, position reporting and control – Australian Aeronautical Information Publication (AIP) GENERAL (GEN) 2.2 – DEFINITIONS AND ABBREVIATIONS, paragraph 1 *Definitions*.

⁴ An instrument landing system (ILS) is a standard ground aid to landing, comprising two directional radio transmitters: the localizer, which provides direction in the horizontal plane; and the glideslope, for vertical plane direction, usually at an inclination of 3°. Distance measuring equipment or marker beacons along the approach provide distance information.

⁵ Runways are named by a number representing the magnetic heading of the runway.

⁶ A tactical air navigation system (TACAN) is an ultra-high frequency navaid which provides continuous indication of bearing and distance, in nautical miles, to the selected station. In the application of separation standards, DME includes TACAN for distance measurement and TACAN distances can be used for the same purpose as DME.

⁷ Defined in Williamtown Base Standing Instructions and the Williamtown aerodrome segment of the AIP En route Supplement Australia.

Figure 1: Williamtown Tower airspace: Dark green shading shows the usual airspace, light green shows additional airspace on 19 September 2013. An orange arrow indicates the duty runway location and direction. A blue dashed line indicates the intended flight path of VH-FIZ during the aerodrome orbit run. A pink cross indicates the initial point used by military aircraft.



Source: Airservices Australia, modified by the ATSB

To reduce the need for extensive voice-coordination between the Tower and Approach controllers, Williamtown ATC added information to an aircraft's data label⁸ on the surveillance data display. The information added to a data label, referred to as silent coordination, was visible to both Approach and Tower controllers. For an arriving aircraft, the Approach controller would add arrival type (e.g. 'T' for a TACAN) or that an aircraft had reported visual ('V'). Both the Tower controllers that day (morning and afternoon shifts) had been using the data label for FIZ to indicate the current run number, and, when known, the next run number. However, at 1530 the Tower controller did not include a run number in the data label of FIZ, rather the label indicated that the calibration aircraft was completing a TACAN approach to runway 12 (which was run 3A) and that the next approach would be a 7 NM (13.0 km) orbit of Williamtown (run 1A). Shortly after, the data label was amended to show that the next run would be the second TACAN approach to runway 12 (run 3B).

At 1537, the Tower controller advised the pilot of the calibrator aircraft that, after the next run (that is, run 3B), FIZ would be required to hold to facilitate a number of arriving aircraft. In response, the pilot of FIZ asked 'on completion of this run would it be possible to join the 7 TAC⁹ counter-clockwise orbit 3,100 and would that keep us clear of traffic?' This referred to run 1A on the

⁸ An aircraft's data label displayed pertinent aircraft data for the controller's use, such as callsign, current altitude, speed, aircraft type and coordination information.

⁹ TAC is an abbreviation of TACAN.

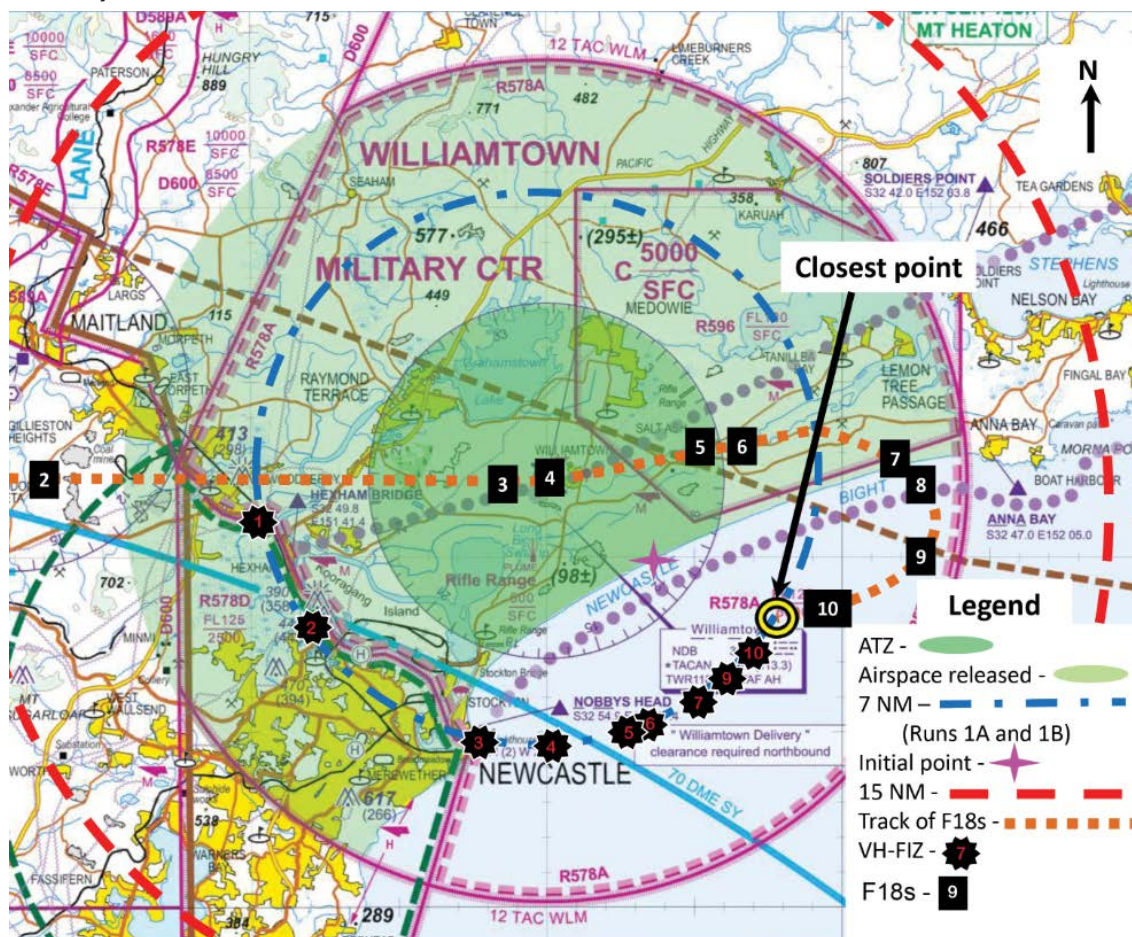
TACAN run sheet, although the pilot did not include 'run 1A' in the request. The Tower controller responded with 'standby'.

To enable the calibration of all of the TACAN equipment, the second of each run number (runs 1B, 2B and 3B) required ground-based technicians to switch to the redundant TACAN system. However, there was a delay in the requested switch for run 3B which was increasingly causing a delay to arriving aircraft, so the Tower supervisor told the Tower controller to cancel run 3B and hold FIZ to facilitate the arrivals.

At 1541, on being advised to hold south of the airfield not above 1,500 ft, the pilot of FIZ asked '... can we climb up and do the orbit then?' The Tower controller responded with '... affirm climb not above 3,100 (ft).' Anticipating that they may become busy with other tasks, the Tower controller reported requesting the Surface Movement controller to monitor FIZ.

At 1543, the pilot of the first of the arriving aircraft, a passenger Airbus A320, contacted the Tower controller and was cleared to track from the north of Williamtown to the right base leg of the circuit for runway 30. At the same time, surveillance data showed that FIZ commenced flying in a counter-clockwise direction (run 1A) around Williamtown from a position 7 NM (13.0 km) to the west of the airfield (position 1 ✱ on Figure 2).

Figure 2: Williamtown airspace showing the location and track of VH-FIZ and a formation of four Boeing F/A18 aircraft (numbers represent relative locations at the same time – see Table 1)



Source: Airservices Australia, modified by the ATSB

At 1546, the pilot of the lead aircraft in a formation of three BAE Systems Hawk aircraft (Hawks) contacted the Tower controller east of Williamtown for a visual approach stream landing¹⁰ via

¹⁰ A formation landing may involve a stream landing where aircraft land on the same runway in quick succession.

'straight initial' (see the section titled *Military operations*) to runway 30. The Hawks were descending to 2,500 ft, 1,000 ft above the level of the A320, and advised the Tower controller that the aircraft would be deploying brake-chutes¹¹ on landing.

At the same time, the pilot of the lead aircraft of a formation of four F18s contacted the Approach controller tracking from the west directly to Williamtown on descent to 8,000 ft. At the time, the transponder for the lead F18¹² indicated that the aircraft was descending through flight level¹³ (FL) 137. The Approach controller entered silent coordination in the data label for the F18s which indicated that the aircraft would track to overhead the airfield and then to the northeast on a heading. No information on how or if the aircraft would return for landing was included.

At 1545, the Tower controller cleared the A320 to land and at 1546 cleared the Hawks for a visual approach. At the same time, the Tower controller was involved in coordinating personnel to enter the runway after the Hawks landed to retrieve the brake-chutes. The surveillance data showed that, nine seconds later, FIZ crossed the coast tracking in a north-easterly direction, leaving the airspace released to the Tower controller and entering airspace under the jurisdiction of the Approach controller (position 3 ●, Figure 2).

Shortly before the formation of F18s passed overhead Williamtown at 1547, the Approach controller cleared the F18s to descend to 5,000 ft and track for an arrival via 'right initial' to runway 30 involving a right descending turn towards the 'initial point' seen in Figure 2 (see the section titled *Military operations*). The Approach controller then removed the heading from the F18s data label. After the pilot of the lead F18 reported the Hawks in sight, the Approach controller cleared the F18s for a visual approach.

Ten seconds after clearing the F18s for a visual approach, the Approach controller updated the silent coordination on the data label to show that the F18s were making a visual approach via right initial (the F18s were then at position 6 ■ in Figure 2). Nine seconds later, at 1548, the pilot of the lead F18 contacted the Tower controller while descending through 6,300 ft and on a converging track with the track of FIZ.

Twenty four seconds later, as FIZ was maintaining 3,100 ft at 7 NM (13.0 km) to the southeast of Williamtown and about 8 NM (14.8 km) from and 1,100 ft below the F18s, the Tower controller asked the pilot of FIZ to confirm that the aircraft was holding south of the airfield. The pilot responded in the negative and that FIZ was conducting a counter clockwise orbit of Williamtown.

Fourteen seconds later, when the aircraft were about 6 NM (11.1 km) apart, the Approach controller alerted the Tower controller to the need for a safety alert¹⁴ between the aircraft. The Tower controller responded that he had 'got it' and 4 seconds later issued a safety alert to the pilot of FIZ: 'safety alert Toxin Tripod four F18s your 2 o'clock passing through 3,000'. At this time, the lead F18 was descending through 3,400 ft, 5 NM (9.3 km) directly in front of and converging with FIZ. At that time, FIZ was travelling at 230 knots (kt) towards the F18s travelling at 460 kt.

At 1549, as the pilot of FIZ reported the F18s in sight, separation between the formation of F18s and FIZ reduced below 3 NM (5.6 km) with the lead F18 descending through 2,700 ft. Nineteen seconds later, the F18s flew directly below FIZ with less than the required 1,000 ft separation and they advised the Tower controller that they were 'visual with the traffic that just passed overhead'

¹¹ Brake-chutes were designed to aid aircraft deceleration on landing. Once the aircraft's speed has been sufficiently reduced, the chute is jettisoned onto the runway and must be retrieved prior to other aircraft using the runway.

¹² As formation aircraft fly close together, to ensure that the surveillance system display did not show overlapping or garbled returns, only the transponder in the lead aircraft in each formation transmitted information.

¹³ At altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 370 equates to 37,000 ft.

¹⁴ A safety alert is the provision of advice to an aircraft when a controller becomes aware that an aircraft is in a position which is considered to place it in unsafe proximity to terrain, obstructions or another aircraft.

Shortly afterwards, the Approach controller resumed the airspace outside 5 NM (9.3 km) Williamtown and above 1,500 ft, and FIZ was transferred to the Approach controller's frequency for the remainder of the calibration flight. The F18s landed shortly afterwards.

Table 1: Location of VH-FIZ and the F18s at specified times as shown in Figure 2

Number	Time	VH-FIZ	F18s
1	15:43:27	commencing run 1A at 3,100 ft	27 NM (50.0 km) west of Williamtown at FL160 (off Figure 2), silent coordination indicated tracking to overhead Williamtown
2	15:44:52		maintaining FL160
	15:46:12		on Approach frequency
3	15:46:26	crossed the coast and exited the airspace released to the Tower controller	descending through FL127
	15:46:38		Approach controller cleared the formation to track for right initial
4	15:46:44		overhead Williamtown descending through FL115
5	15:47:21		descending through 8,300 ft, cleared for a visual approach
6	15:47:30		silent coordination updated to indicate tracking for right initial
	15:47:34		on Tower frequency
7	15:48:04	Tower controller asked '... just confirming remaining south of the field'	descending through 4,500 ft
		8 NM (14.8 km) separation	
8	15:48:22		descending through 3,700 ft
		6 NM (11.1 km) separation	
9	15:48:36		descending through 3,000 ft
		4 NM (7.4 km) separation	
	15:48:41	reported the F18s in sight	descending through 2,700 ft
		3 NM (5.6 km) separation	
10	15:48:50		at right initial and descending through 2,400 ft
	15:49:00	maintaining 3,100 ft	descending through 2,300 ft, directly below FIZ

Context

Background

As a Department of Defence (Defence) airfield, air traffic services at Williamtown, also known as Newcastle Airport, were provided by Defence personnel. Approval had been granted for the operation of a number of civil aircraft, including regular public transport flights. In 2013, there were 16,764 domestic/regional airline movements¹⁵ into and out of Williamtown.¹⁶ In addition to airlines and military aircraft, civilian general aviation aircraft also regularly used the airfield.

Airspace

Williamtown Tower controllers are normally responsible for the Aerodrome Traffic Zone (ATZ) (shown as the dark green area in Figure 1) that includes the circuit area; 5 NM (9.3 km) radius of Williamtown, over land only, from the surface to 1,500 ft above mean sea level (AMSL).

On the morning of the occurrence, the Tower and Approach supervisors learnt that calibration check activities for the instrument landing system (ILS) and the tactical air navigation system (TACAN) would commence at 1100. There were no procedures in place relating to the control and sequencing of the calibration flight. To expedite the calibration activity and reduce the workload of both the pilot and controllers, the Tower and Approach supervisors agreed that VH-FIZ (FIZ) would remain on the Tower controller's frequency and operate in airspace normally under the jurisdiction of the Approach controller. To achieve this, airspace usually under the control of Approach was released to the Tower. The released airspace, over land within a 12 NM (22.2 km) radius of Williamtown, from the surface to 3,500 ft (light green area of Figure 1), would contain all of the planned calibration runs apart from the two 7 NM (13.0 km) orbits of Williamtown. The latter required FIZ to track over water in airspace controlled by Approach.

The airspace was released to the Tower controller 2 minutes before FIZ became airborne. The pilot of FIZ had been cleared to operate within 15 NM (27.8 km) of Williamtown not above 3,300 ft. However, as the clearance did not specify 'over land', the clearance contained the airspace required to complete all calibration runs.

Personnel information

On weekdays, three controllers normally worked in Williamtown Tower – a Tower supervisor, a Tower controller and a Surface Movement controller. On the morning of the occurrence, two additional controllers were present – a training officer and a checking controller. The afternoon shift comprised three controllers – the Tower supervisor, the Tower controller and a newly endorsed Surface Movement controller. All controllers held the appropriate endorsements to provide a Tower control service for aircraft operating within the Williamtown airspace.

A review by the Australian Transport Safety Bureau (ATSB) indicated that the roster for the controllers was unlikely to have resulted in work-induced fatigue.

The primary duty of the Tower controller was to visually separate aircraft. The surveillance display could be used as a separation and situation awareness aid, as long as that utilisation did not detract from the primary duty of applying visual separation. The intent of allowing Tower controllers to use the display to establish or monitor separation was to enable the controller to convert a radar separation standard established by the Approach controller into a Tower visual separation standard for arriving aircraft and vice versa for departing aircraft. The display was not

¹⁵ Movements refer to the combination of take offs and landings.

¹⁶ Source: Bureau of Infrastructure, Transport and Regional Economics, *Airport traffic data*
http://www.bitre.gov.au/publications/ongoing/airport_traffic_data.aspx

designed to enable Tower controllers to use radar as the primary method of separation between aircraft operating within the ATZ.

The larger than usual volume of airspace released to the Tower controller required the controller to, on occasion, use the display to monitor and separate aircraft, even though they were not trained to use radar separation. Neither the afternoon Tower supervisor nor the Tower controller had ever operated with such a large volume of airspace. They both reported that it had been difficult to see the calibration aircraft and that often binoculars were needed to see FIZ.

Aircraft information

The operator of FIZ provided calibration services to both of Australia's air navigation service providers – Airservices Australia and Defence. The flight crew included a number of technicians to undertake the actual calibration tasks while the pilot maintained a pre-determined and specific flight path and level.

The four Boeing F/A18 aircraft (F18s) were operated by Defence personnel based at Williamtown. The F18 flight crew operated in accordance with procedures designed to provide separation assurance and contained within the Williamtown Base Standing Instructions (Base SIs), available to both the Defence aircrew and air traffic control (ATC) personnel.

Calibration activities

Both the ILS and the TACAN were designed for use by aircraft in instrument meteorological conditions (IMC)¹⁷ and both provided guidance to aircraft during the final stages of an approach to land. Routine monitoring, ground testing and maintenance ensured that the systems performed within the specified tolerances and that the operational integrity and serviceability of the systems were maintained. Australia-wide, periodic flight testing (calibration) was required to ensure that ground-based aeronautical navigational equipment remained within the tolerances required for the safe operation of aircraft.

The Flight Commander¹⁸ at Williamtown was given 24 working days' notice that a calibration aircraft would be operating there for a 2-day period. The run sheet for the instrument landing system (ILS) calibration was emailed to Williamtown 2 days prior to the occurrence, but those for the tactical air navigation system (TACAN) were only emailed on the morning of 19 September 2013 (the day of the occurrence). Additionally, the TACAN run sheet was only provided in 'draft' to the operational personnel, not to the Flight Commander.

The run sheet for the ILS listed 23 runs and included a copy of the Williamtown visual terminal chart (VTC) with relevant information added. The ILS run sheet indicated that some runs could be deleted, and that runs would not necessarily be consecutive. The run sheet for the TACAN calibration was emailed to Williamtown in draft format, with a note 'The run numbers are to assist with Pilot/ATC communications, not to indicate the order in which the runs will be completed.' Although the approaches and manoeuvres were listed as runs, the layout was significantly different to that used on the ILS run sheet. The TACAN runs included two 7 NM (13.0 km) orbits around Williamtown (runs 1A and 1B, the blue broken line in Figure 1) and two approaches to each runway (runs 2A and 2B to runway 30, runs 3A and 3B to runway 12).

At about 1500, when the afternoon Tower shift commenced work, FIZ had completed almost all of the ILS runs, but had yet to commence the TACAN runs.

¹⁷ Instrument meteorological conditions (IMC) describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under instrument flight rules (IFR), rather than by outside visual references. Typically, this means flying in cloud or limited visibility.

¹⁸ The Flight Commander was the senior air traffic controller at Williamtown and responsible for the provision of an air traffic service.

When run 3B was cancelled and the pilot of the calibration aircraft asked ‘... can we climb up and do the orbit then?’ the Tower controller reported that they expected FIZ would complete a holding orbit. That is, that the pilot would conduct a continuous steady rate turn to remain to the south of the airfield. However, the tracking of FIZ demonstrated that, on receiving the response ‘...affirm climb not above 3,100’, the pilot understood the controller had cleared the calibration aircraft for the 7 NM (13.0 km) orbit around the Williamstown TACAN.

Military operations

Military fast jets and some training aircraft operate predominately in formation where the pilots of two or more aircraft fly in close proximity to each other and operate as a single aircraft with regard to navigation, position reporting and control.¹⁹

Military aircraft ‘initial and pitch’ circuit procedures were as follows:

For military fast jet and training aircraft, the preferred method of joining the circuit is via a procedure known as Initial and Pitch. The aircraft (or formation) will track to the Initial Point, a point at 5 NM downwind of the runway in use displaced to the dead side, and track inbound at high speeds. At any stage once abeam the threshold of the runway in use, and safe to do so, the aircraft turns (“Pitches”) to join downwind and configures for landing.²⁰

The initial point for runway 30 was a position at the intersection of a line aligned slightly north of the runway and the coast to the east of Williamstown (pink cross on both Figure 1 and 2). Base SIs required military pilots to report their position to the Tower controller 30 seconds prior to the initial point as left, right or straight initial – the direction denoting the turn required from their arrival path to align with the landing direction. Traffic information²¹ was provided to these aircraft following that report.

Organisational and management information

Coordination

The 453 Squadron Williamstown Flight Standing Instructions (ATC SIs) stipulated that the Approach controller did not need to seek a clearance from the Tower controller for visual approaches to the duty runway for locally-based Hawk and F18 aircraft. They also stipulated that those aircraft on a visual approach would be transferred to the Tower frequency at 10 NM (18.5 km). However, the Approach controller was required to coordinate all traffic that would infringe the ATZ.

To reduce workload when the ATZ was controlled by the Tower controller, voice coordination from Approach to Tower controllers for arriving locally-based Hawk and F18 aircraft was replaced by silent coordination. Silent coordination was conducted by placing the intentions for the aircraft in the data label for the aircraft or formation on the surveillance display, utilising abbreviations listed in the ATC SIs.

Strategic separation assurance

The Manual of Air Traffic Services (MATS)²² stipulated that separation assurance must be applied. It defined strategic separation assurance as:

¹⁹ AIP GEN 2.2 – DEFINITIONS AND ABBREVIATIONS, paragraph 1 *Definitions*.

²⁰ AIP EN ROUTE (ENR) 1 – GENERAL RULES AND PROCEDURES, Section 48 *LANDING MANOEUVRES*, paragraph 48.8 *Military Initial and Pitch Circuit Procedures* 48.8.1 and 48.8.4.

²¹ Traffic information is issued by a controller to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of the flight and to help the pilot avoid a collision.

²² The Manual of Air Traffic Services (MATS) is a joint Department of Defence (Defence) and Airservices Australia (Airservices) document, based on the rules published in Manual of Standards Part 172 (MOS 172) and the International Civil Aviation Organization standards and recommended practices, combined with the rules specified by Airservices

Strategic separation assurance is the designing of airspace, air routes, air traffic management plans and air traffic control practices, to reduce the likelihood that aircraft will come into conflict, particularly where traffic frequency congestion or system performance, amongst other considerations, may impair control actions.

Strategic separation assurance was provided at Williamstown and published in the Base and ATC SIs. When issued a visual approach, pilots of locally-based military aircraft were required to remain outside the Tower's airspace until provided with traffic information on aircraft within that airspace. The normal vertical limit of the Tower's airspace was 1,500 ft with a requirement that local military aircraft were required to overfly not below 2,500 ft. On the day of the occurrence the Tower's airspace was increased to 3,500 ft. However, as the operators of the local military aircraft were not advised, the minimum overfly altitude remained unchanged at 2,500 ft. Changing the airspace on the day of the occurrence without changing these requirements, or amending the silent coordination arrangements, negated the documented strategic separation measures applicable to locally-based military aircraft.

Separation

Separation is the concept of ensuring an aircraft maintains a prescribed minimum distance from another aircraft or object. Within controlled airspace, ATC provided separation using standards specified in the Manual of Standards Part 172²³ (MOS 172) and listed in MATS. Although different standards could be used between military aircraft, Williamstown ATC used the MOS 172 standards when controlling civil, or a combination of civil and military, aircraft. Only one separation standard was required to be in place between aircraft at any one time, but another standard had to be established by a controller prior to the current separation minimum being infringed. Controllers normally base the method of separation on operational advantage but the type of separation standard used depends on a number of factors.

The ATC SIs required the Tower controller to separate and sequence circuit aircraft with all arrivals, departures and transits of the ATZ. As well as all aircraft conducting operations in the ATZ, aircraft arriving via the initial point were considered to be circuit aircraft at the initial point.

The methods of separation used by Williamstown Tower controllers were predominately vertical and visual. Although the Tower controller had access to a surveillance display, they were not trained or endorsed to use that equipment for radar separation, and as such, the surveillance standard of 3 NM (5.6 km) did not apply. However, the Tower controller could use the surveillance display to assist with situation awareness and for silent coordination (see the section on *Coordination*).

The use of one of the two vertical separation standards available to the Tower controller, 500 ft or 1,000 ft, was dependent on the maximum take-off weight (MTOW) of the aircraft being separated. If both aircraft were 7,000 kg MTOW or less, 500 ft could be used. Although the MTOW of the calibration aircraft was below 7,000 kg, the weight of the F18s was considerably higher so the appropriate minimum vertical separation standard between FIZ and the F18s was 1,000 ft.

To determine the altitude of the F18s for separation purposes, the Tower controller could request the pilot of the lead F18 to report when the formation had descended through 2,100 ft (1,000 ft below FIZ).

Two visual separation standards were available to the Tower controller. The use of the visual (pilot) separation standard transferred separation responsibility from ATC to the pilot of an aircraft and required that pilot to ensure that their aircraft remained clear of other aircraft. A number of requirements existed for the use of the visual (pilot) standard, the most relevant to this occurrence

and Defence. The requirements and obligations in MATS are in accordance with provisions and regulations of the *Air Navigation Act 1920*, the *Air Services Act 1995*, and Defence Instructions. MATS is not publically available.

²³ MOS 172 *Air Traffic Services* outlined the requirements and standards for air traffic services in compliance with Civil Aviation Safety Regulation (CASR) 1998 Part 172 *Air Traffic Service Providers*, including aircraft separation.

were that the pilot of one aircraft had to have reported the other aircraft in sight and the pilot of the other aircraft, if IFR, had to have been provided with traffic information and advised that the responsibility for separation had been transferred.

The visual (ATC) separation standard could be used between aircraft that had been positively identified by the Tower controller visually identifying the aircraft type. Prescribed separation minima could be reduced in the vicinity of airfields when adequate separation could be provided using visual observation and each aircraft was continuously visible by the Tower controller. However, visual (ATC) separation could only be applied when the projected flight paths of the aircraft did not conflict. As long as the calibration aircraft remained over land to the south of Williamtown, the visual (ATC) separation standard existed.

The lateral separation standard of 1 NM (1.9 km) could have been applied to the aircraft if their positions were determined relative to a prominent topographical feature. If the Tower controller has issued positive holding instructions to the pilot of FIZ to hold over land to the south of the airfield, and the controller had established that the aircraft was holding in that position either by sighting the aircraft or by pilot report, the lateral standard would have existed.

Of the separation standards available to the Tower controller, the only applicable standards on the day were 1,000 ft vertical, visual (pilot) or lateral. As the requirements for the visual (pilot) standard and the lateral standard were not in place, 1,000 ft was required between FIZ and the F18s. When the Tower controller identified that FIZ was over water to the south-east of the airfield, they asked the pilot for confirmation that the aircraft was holding to the south. However, if the Tower controller had at that time issued turn instructions to the pilot to re-establish FIZ over land and clear of the projected flight path of the F18s, the visual (ATC) separation standard would have been re-established between the calibration aircraft and the F18s.

Monitoring aircraft

To ensure that separation was maintained, Tower controllers were required to monitor the traffic situation. However, the Tower controller did not monitor the location of FIZ holding to the south and was therefore unaware that the aircraft had crossed the coast and left the airspace under their jurisdiction. Although the Tower controller had requested that the Surface Movement controller monitor FIZ, monitoring an aircraft of that size at that distance was difficult. Additionally, the Approach controller did not monitor the airspace under their jurisdiction sufficiently to observe FIZ crossing the coast.

Compromised separation recovery

If a controller determined that aircraft were, or would be, in unsafe proximity, the controller was required to issue a safety alert, using the following prescribed phraseology:

SAFETY ALERT TRAFFIC (number) MILES OPPOSITE DIRECTION / CROSSING LEFT TO RIGHT / RIGHT TO LEFT (level information).²⁴

Although the Tower controller did issue a safety alert to the pilot of VH-FIZ, the correct phraseology was not used, and no safety alert was provided to the F18 pilots.

Supervision

The Tower supervisor was responsible for, among other activities, supervising and coordinating the work of the Tower and Surface Movement controllers, and for maintaining a close working liaison with the Approach supervisor.

The Tower supervisor reported that the calibration aircraft was difficult to see when it tracked to hold south of the airfield and that they had told the Tower controller a number of times to provide

²⁴ AIP GEN 3 SERVICES, Section 3.4 *COMMUNICATION SERVICES*, Subsection 5 *PHRASEOLOGIES*, paragraph 5.1 *Traffic Alert and Collision Avoidance System (TCAS), Safety Alerts and Avoiding actions and Wind Shear Escape*.

clearer holding instructions to the pilot of FIZ as the aircraft did not look like it was holding as expected.

Close liaison was a regular activity for the supervisors to optimise traffic management as the majority of Williamtown Tower traffic was high speed military aircraft, sometimes requiring last-minute sequence changes for operational reasons.

Priorities

The Australian Aeronautical Information Publication (AIP) stated that an aircraft first able to use the airspace in the normal course of its operations would be given priority. However, as the AIP allowed for aircraft engaged in navigation aid checks to be given priority, controllers prioritised FIZ's operations as much as possible. The prioritisation was achieved by holding departures on the ground and holding arrivals outside the calibration aircraft's area of operations for short periods of time, then holding FIZ to facilitate departures and arrivals.

Risk management

Defence required the use of aviation risk management strategies across all aviation activities. In line with this, the agency responsible for Defence air traffic services stipulated that any complex, new, unusual or irregular activity required a risk assessment and that treatments be developed for any risks assessed as medium or higher.

Williamtown ATC had in place a number of generic risk assessments and treatments for occasions when less than the required number of endorsed personnel were available to assist decision making while balancing controller workload and safety. Issues requiring consideration included anticipated traffic complexity or unusual activity, complexity of airspace, and experience levels. The documentation provided direction on the number of personnel required and methods for reducing the number or complexity of traffic. Within each assessment, the level of risk had been assessed in line with specific conditions and/or treatments – including staffing and traffic levels, weather, equipment serviceability and airspace configuration. However, there were no risk assessment for increased traffic complexity (such as a calibration aircraft operating to the non-duty runway) or for additional airspace being released to the Tower controller.

Although executive personnel within the Williamtown ATC unit were notified of the calibration flight inspection 5 weeks prior to the event on 15 August 2013, and further details of the proposed inspection were available from an internal Defence website, the Williamtown Flight Commander reported that, as calibration flights occurred a number of times each year at Williamtown, they were not considered irregular activities and therefore did not require the development of a risk assessment or treatment. The Flight Commander noted that initial notification of calibration flights had provided no details.

Previous occurrences

A review of the ATSB database identified three notifications involving a calibration aircraft at Australian airfields in the 7 years prior to, and one shortly after, the Williamtown occurrence. None of these notifications were investigated by the ATSB.

The ATSB research report *AR-2012-034 Loss of separation between aircraft in Australian airspace – January 2008 to June 2012*, noted that 'assessing and planning' or 'monitoring and checking' errors were involved with most individual controller actions that contributed to loss of separation (LOS) occurrences. Ineffective management of compromised separation before it became a LOS was categorised as an assessing and planning error. Monitoring and checking errors included controller actions associated with maintaining awareness of traffic disposition and not detecting that the pilot of an aircraft was not complying with an instruction when there was opportunity to detect this.

Additionally, the ATSB report found that about a quarter of LOS occurrences contributed to by ATC actions involved communication errors. These included not passing traffic information to

pilots once separation was compromised and not providing clear, timely or urgent instructions to pilots when separation had been lost to ensure that immediate action was taken to avoid other aircraft or re-establish separation.

The research report found that task demands were the most common type of local condition identified in LOS occurrences where controllers were involved – in particular, high workload and distractions. Common in all ATC environments, these local conditions were more common in the Tower environment. Controller knowledge, skills and experience factors were also identified as local conditions in LOS occurrences.

Safety analysis

Although the opportunity for Williamtown air traffic control (ATC) to undertake prior planning for the calibration operations had existed in the 24 working days between the initial notice and the activity, no such planning took place. Defence air traffic services stipulated that any complex, new, unusual or irregular activity required a risk assessment. However, as calibration flights occurred a number of times each year, the Williamtown ATC Flight Commander did not believe that such activity required the conduct of a risk assessment. In addition, although Williamtown ATC had in place a number of generic risk assessments and treatments for unusual situations, there were no risk assessment for increased traffic complexity such as that created by the calibration activities.

Prior planning and a risk assessment had the potential to identify the need to increase staffing in both the Tower and Approach areas, provide briefings for ATC personnel and the pilots of locally-based aircraft, and ensure controllers had a thorough understanding of the calibration run sheets prior to the activity commencing. Such prior planning would have incorporated strategic separation assurance considerations.

The Williamtown Approach controller released airspace to the Tower controller that was considerably larger than that normally controlled by the Tower. That resulted in both the Tower supervisor and the Tower controller having difficulty monitoring the airspace visually, and the need for the Tower controller, though not trained in the use of radar separation, to rely on the surveillance display for situation awareness as well as separation. In situations where the location of an aircraft is known (from a position report or from observing a surveillance display), a controller could quickly use the binoculars to locate an aircraft. However, to locate an aircraft at an unknown position, the controller would need to scan the sky, possibly with the assistance of binoculars. Although binoculars were available to the controllers, binoculars could potentially limit the controller's view. Using binoculars would also have been time-consuming.

During the morning, there had been two additional controllers in the Tower cabin than normal. They were able to assist with monitoring VH-FIZ (FIZ), and a number of the controllers present had experience with the use of surveillance data for monitoring aircraft and providing separation instructions. At the time of the occurrence, only three controllers were in the Tower cabin. One was newly endorsed in Surface Movement control, without having undertaken training in the control of airborne aircraft. The other two controllers present were not trained in separating aircraft with surveillance data.

Williamtown Base Standing Instructions (Base SIs) and 453 Squadron Williamtown Flight Standing Instructions (ATC SIs) contained restrictions and requirements, for both controllers and locally-based military aircrew, to provide strategic separation assurance between arriving locally-based military aircraft and those within the airspace normally controlled by the Tower controller. These specifically required the local aircraft to remain clear of airspace under the Tower controller's jurisdiction until issued with traffic information. The last minute planning conducted on the morning of the occurrence by two ATC supervisors, though well intentioned, resulted in less than optimal conditions. These included procedures that negated the established strategic separation assurance documented in both Base and ATC SIs, increased traffic complexity, and the need for the Tower controller to rely on the surveillance display when the controller was not trained to use radar separation.

The run sheet provided to ATC for the calibration of the tactical air navigation system (TACAN) numbered each required run and included a note 'The run numbers are to assist with Pilot/ATC communications, not to indicate the order in which the runs will be completed.' Had the pilot of VH-FIZ (FIZ) used the run number (Run 1A) in the request to conduct the 7 NM (13.0 km) orbit around Williamtown, the Tower controller may not have misinterpreted the pilot's request with a request to hold south of Williamtown in an orbit – a standard holding manoeuvre that would essentially keep the aircraft in the same area. However, as the only calibration runs requiring 3,100 ft were the 7 NM (13.0 km) orbits of the Williamtown TACAN, the Tower controller's

reported belief that the pilot of FIZ had asked for that altitude to prepare for the next run to runway 30, for which the run sheet indicated a commencement altitude of 1,500 ft, demonstrated that the controller was either not referring to the run sheet or did not understand the run sheet.

If the Tower controller had used run numbers on the data labels for silent coordination, the Approach controller would have had the opportunity to maintain situation awareness of calibration activities. Further, the use of run numbers would have provided cues to the Tower controller. In turn, the Tower controller may then have been more likely to use the numbers in communication with the pilot of FIZ, removing the opportunity for the pilot to misunderstand the controller's approval to conduct an orbit.

Although prompted a number of times by the Tower supervisor, the Tower controller did not issue specific holding instructions to the pilot of FIZ. Specific holding instructions could have included 'hold over land to the south of the field' or to hold over a specific location. Such an instruction would have resulted in the pilot of FIZ questioning their understanding of the approval to conduct an orbit.

Once the pilot of FIZ commenced the 7 NM (13.0 km) orbit around Williamtown, in line with the pilot's interpretation of the Tower controller's response to the request, a loss of separation assurance (LOSA) existed between the calibration aircraft and the formation of four Boeing F/A18 aircraft (F18s) tracking for runway 30. Believing that FIZ was holding to the south in an orbit, the Tower controller did not visually monitor FIZ's position. Instead, the Tower controller relied on the Surface Movement controller to do so while the Tower controller attended to other aircraft.

An opportunity to identify the loss of separation assurance at an earlier point was lost when the Approach controller did not identify that FIZ had crossed the coast, leaving the airspace released to the Tower controller. The Tower controller had not coordinated FIZ's entry into airspace under the jurisdiction of the Approach controller. However, the Approach controller should have observed the calibrator entering and remaining in airspace under their jurisdiction. FIZ crossed the coast into the Approach controller's airspace prior to the F18s passing overhead Williamtown and before they were issued with a visual approach. If FIZ had been identified in the Approach controller's airspace at this stage, the F18s could have been held away to allow FIZ to complete the 7 NM (13.0 km) orbit of Williamtown, or the Tower controller could have been instructed to turn FIZ to re-establish the calibration aircraft over land. When the Approach controller did observe FIZ and realise the potential conflict with the F18s, they immediately contacted the Tower controller and asked that a safety alert be issued.

Once the Tower controller became aware of FIZ's position to the south-east over water, clear and urgent information was not immediately provided to the pilot to ensure separation and avoidance with the F18s. As the closure speed between the calibration aircraft and the F18s was very high, the opportunity to provide timely control instructions and traffic information was lost when the controller asked the pilot of FIZ to confirm that the aircraft was holding to the south even though the controller had observed the aircraft tracking in a northerly direction south-east of Williamtown. The absence of clear control instructions to either the calibration aircraft or the formation of F18s resulted in a loss of separation (LOS) between aircraft that had not been provided traffic information in relation to the impending conflict. The absence of traffic information in sufficient time and in sufficient detail increased the risk posed by the LOS.

Findings

From the evidence available, the following findings are made with respect to the loss of separation between a Beechcraft B300, registered VH-FIZ, and a formation of four Boeing F/A18 aircraft that occurred near Williamtown (Newcastle Airport), New South Wales on 19 September 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- **The applicability of a general requirement to conduct aviation risk assessments for complex, new, unusual or irregular activities was open to interpretation. [Safety issue]**
- The absence of prior planning relating to the operation of the calibration aircraft resulted in a work-around that did not address all related safety aspects and negated the existing strategic separation assurance.
- The Williamtown Approach controller released airspace to the Tower controller that was considerably larger than that normally controlled by the Tower, resulting in both the Tower supervisor and the Tower controller having difficulty monitoring the airspace visually, and the need for the Tower controller, though not trained in the use of surveillance control, to rely on the surveillance display for separation.
- The absence of specific control instructions by the Tower controller to the pilot of VH-FIZ created an opportunity for the pilot to misunderstand the Tower controller's intent in relation to the pilot's requested 'orbit'.
- The Tower controller did not monitor the flight path of VH-FIZ due to an assumption the aircraft would remain in the area the controller had intended the aircraft to remain, leading to a loss of separation assurance.
- The Approach controller did not monitor their airspace sufficiently well to observe VH-FIZ crossing the coast into airspace under their jurisdiction, removing the chance for earlier detection of the loss of separation assurance.
- The Tower controller did not provide immediate and clear control instructions to either VH-FIZ or the formation of F18s once the conflict was detected, resulting in a loss of separation with the formation of Boeing F/A18 aircraft flying directly below VH-FIZ with less than 1,000 ft separation.

Safety issues and actions

The safety issue identified during this investigation is listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are repeated separately on the ATSB website to facilitate monitoring by interested parties. Where relevant the safety issues and actions will be updated on the ATSB website as information comes to hand.

Absence of prior planning

Number:	AO-2013-160-SI-01
Issue owner:	Department of Defence
Operation affected:	Aviation: Airspace management
Who it affects:	Department of Defence air traffic services

Safety issue description:

The applicability of a general requirement to conduct aviation risk assessments for complex, new, unusual or irregular activities was open to interpretation.

Proactive safety action taken by the Department of Defence

Action number: AO-2013-160-NSA-043

The Department of Defence took proactive action to improve the implementation of aviation risk management (AVRM) to ensure that AVRM plans developed for unusual or irregular operations, such as calibration operations, addressed staffing and traffic levels, coordination and workload. AVRM using this updated policy has been utilised for subsequent calibration activity.

Current status of the safety issue

Issue status: Adequately addressed

Justification: Changes made to the aviation risk management instructions have clarified those activities that require a review of risk assessments.

General details

Occurrence details

Date and time:	19 September 2013 – 1549 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Loss of separation	
Location:	near Williamtown Aerodrome, New South Wales	
	Latitude: 32° 47.70' S	Longitude: 151° 50.07' E

Aircraft details – VH-FIZ

Manufacturer and model:	Hawker Beechcraft Corporation B300	
Year of manufacture:	2011	
Registration:	VH-FIZ	
Serial number:	FL-779	
Type of operation:	Aerial work – other	
Persons on board:	Crew – 4	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Damage:	None	

Aircraft detail – Department of Defence F/A18 aircraft

Manufacturer and model:	Boeing Company F/A18 x four	
Type of operation:	Military	
Persons on board:	Crew – 1, 2, 1, and 2	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Damage:	None	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- the Department of Defence (Defence)
- Airservices Australia
- the operator and pilot of VH-FIZ.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to Defence, the pilot and operator of VH-FIZ and the air traffic controllers directly involved.

Submissions were received from Defence. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report Aviation Occurrence Investigation

Loss of separation involving a Beechcraft B300, VH-FIZ and a formation of four Boeing F/A18 aircraft near Willamtown, New South Wales, 19 September 2013

AO-2013-160

Final – 12 November 2015